

NEW SPECIES OF PROSOPISTOMA FROM THE ORIENTAL REGION (PROSOPISTOMATOIDEA: EPHEMEROPTERA)¹

BY

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ABSTRACT

Five new Oriental species of *Prosopistoma*, *P. palawana*, *P. boreus*, *P. sedlaceki*, *P. lieftincki*, and *P. indicum*, are described from mature nymphs. A redescription of *P. wouterae* Lieftinck is given based on two paratopotypes. Included is a key to the mature nymphs of these six species of *Prosopistoma*. Some external morphological structures of the mature nymphs are discussed as specific characters. The nymphs of all six Oriental species of *Prosopistoma* possess six pairs of abdominal gills.

Although the genus *Prosopistoma* occurs in Europe, Africa, Asia, the Sunda region, New Guinea, and Solomon Islands, it remains relatively unknown to most mayfly specialists. GILLIES (1954) summarized the history of *Prosopistoma* to 1954. Unknown to GILLIES, LAFON (1952) described the nymphal morphology of the single European species, *P. foliaceum* Fourcroy. GILLIES (1954) described from Africa two new species, *P. africanum* and *P. crassi*, and gave the first detailed description of the adult males and females of *Prosopistoma* (*P. africanum*); he included also a description of the nymphs, a review of all previously described species, a discussion of useful taxonomic characters, and a discussion of the biology of *P. africanum*. Previously, the only known adult specimens were the females of *P. foliaceum* obtained by VAYSSIÈRE (1881) and VAYSSIÈRE (1925). Within six months of GILLIES' publication the adult males of *P. foliaceum* were described independently by FONTAINE (formerly LAFON) (1955) and DEGRANGE (1955). Later GILLIES (1956) discussed differences in the adult descriptions by the three authors and noted the existence of the sixth pair of abdominal gills in the nymphs of several species. The remaining four described African species are known only from the nymphs. Of these only two have been formally described, *P. variegatum* Latreille (1833) and *P. deguernei* Vayssièr (1893), while the other two were discussed as *Prosopistoma* species by VAYSSIÈRE (1936) and PAULIAN (1947).

LIEFTINCK (1932) described from nymphs collected in Java *P. wouterae*, the only named species from the Oriental Region. Later ULMER (1940) recorded an

¹) The research on which this report is based was partially supported by a grant from the National Science Foundation, William L. PETERS, Principal Investigator, University of Utah, Salt Lake City. Specimens of *Prosopistoma* collected by the author in Asia were from field trips supported by a grant from the National Science Foundation, GEORGE F. EDMUNDS, Jr., University of Utah, Principal Investigator, and a Grant-in-Aid of Research from the Society of the Sigma Xi, William L. PETERS, Principal Investigator.

additional nymph of this species collected in Sumatra, and HENRY (1929) noted a nymph of *Prosopistoma* sp. collected in Ceylon. Described herein are five closely related new species of *Prosopistoma* occurring in the Oriental Region. All five species are described from the mature nymphs only. Also included is a re-description of *P. wouterae* based on two nymphal paratopotypes.

The term Oriental Region, as used in this paper, includes New Guinea. The collections of Ephemeroptera which others and myself have made in New Guinea indicate that its mayfly fauna is largely or perhaps entirely Oriental in origin.

Only two male imagos and no female imagos of *Prosopistoma* are known to me from the Oriental Region. Both male specimens were collected from Pahang, Malaysia, and are deposited in the collections of the Bernice P. Bishop Museum, Honolulu. Until the adults of *P. wouterae* and the new species described herein are known, the description of the Malaysian adults is delayed. Preliminary study indicates these two male imagos are morphologically similar to those of *P. foliaceum* and *P. africanum*.

As most species of *Prosopistoma* are known only from the nymphs, GILLIES (1954) discussed the value of some nymphal morphological structures used as taxonomic characters. He suggested that the color pattern on the mesonotum might be important taxonomically. GILLIES noted that only in completely mature specimens these patterns were obscured occasionally by the dark color of the adult within. This occurs in all Asian species described herein. Also the color pattern of some mature nymphs of *P. lieftincki* spec. nov. is somewhat different from the color pattern of most mature nymphs observed and this difference is not due to the dark color of the adult within. The color pattern of some immature nymphs of *P. boreus* spec. nov. is more distinct than the color pattern of mature nymphs. The study of large samples of this species from two localities about 100 miles apart, shows that color pattern differences do occur geographically (Fig. 1 and 4). While the color pattern of the mesonotum appears to be distinct for each species occurring in the Oriental Region, some geographic and age variations occur.

GILLIES (1954) stated that the antennae of the nymphs possess five segments, although occasional specimens of *P. africanum* have only four segments. Both of the known nymphal specimens of *P. indicum* spec. nov. have four-segmented antennae. Occasional specimens of *P. boreus* spec. nov. and *P. palawana* spec. nov. have four-segmented instead of five-segmented antennae. Several specimens of *P. lieftincki* spec. nov. possess six-segmented antennae. LIEFTINCK's (1932) figure of the antennae of *P. wouterae* indicates a possible small, apical, sixth segment. This apical segment is not apparent on the two paratopotypes examined. While the relative lengths of the antennal segments appear to be excellent taxonomic characters, occasionally the number of segments vary within a species.

GILLIES (1954) also concluded, that the relative proportions of the mesonotum offer good specific characters even in the smallest nymphs. With regard to the large series of *P. boreus* spec. nov. this statement is correct; but, occasional specimens of *P. palawana* spec. nov., *P. indicum* spec. nov. and *P. lieftincki* spec. nov. have varying proportions of the mesonotum. However, the relative proportions of the mesonotum are similar in all known Oriental species and therefore of no value in distinguishing the species. The outline shape of the

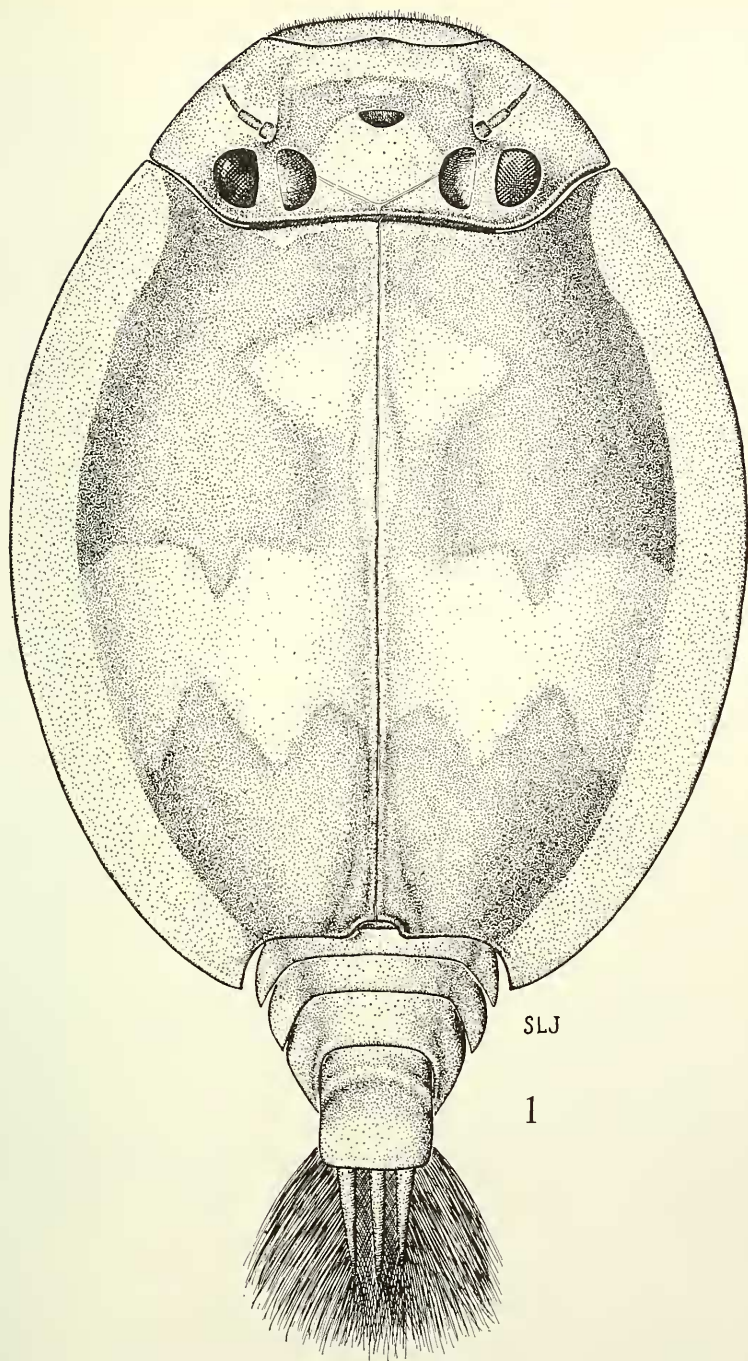


Fig. 1. *Prosopistoma boreus* (paratype), mature nymph, dorsal view

mature nymphs of all Oriental species is distinct, but early instar nymphs are too variable to use this character for species separation.

GILLIES (1956) pointed out that a minute sixth pair of abdominal gills have been found in all described species except *P. deguernei*, *P. wouterae*, and the *Prosopistoma* species discussed by VAYSSIÈRE and PAULIAN. All of the Oriental species possess six pairs of gills including *P. wouterae*. Probably six pairs of gills occur in all species of *Prosopistoma*.

The posterolateral projections on abdominal segments 7—9 are distinct in shape in some of the species (figures 8 and 9). But the dorsal surfaces of these projections are rounded and a projection often appears different in shape if not always viewed in the same plane.

While I agree with GILLIES (1954) that many nymphal characters are available to separate the species, most useful characters are extremely minute. Only by careful dissection and use of high power dissecting and compound microscopes can most species of *Prosopistoma* be identified in the nymphs.

Prosopistoma is confined to the Eastern Hemisphere, and judging from its present distribution, dispersal apparently occurred between the Ethiopian and Palearctic regions and the Palearctic and Oriental regions. All known species from the Oriental region appear to represent one closely related group, thus indicating one possible dispersal into the region. While the distribution pattern of the Oriental species seems to indicate the phylogeny of the species, the morphology of the nymphs does not clarify these relationships. The phylogeny of the Oriental species will undoubtedly be more fully understood when the adults of all species are known.

Acknowledgements

I offer my sincere appreciation to Dr. M. A. LIEFTINCK, Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands, who greatly encouraged my work on this paper. The completion of this work was dependent upon the following persons for the loan or gift of specimens; Dr. P. BRINCK, Zoological Institute, Lund, Sweden (specimens from the Swedish Ceylon Expedition 1962); Dr. M. A. LIEFTINCK (specimens from the Third Archbold Expedition and paratopotypes of *P. wouterae*); Dr. B. PETERSEN, Zoological Museum, Copenhagen (specimen from the Noona Dan Expedition, 1961—62); Dr. J. L. GRESSITT, Bernice P. Bishop Museum, Honolulu; and Dr. R. L. WENZEL, Field Museum of Natural History, Chicago, Illinois. I wish to thank Drs. G. F. EDMUNDS, Jr., P. BRINCK, and M. A. LIEFTINCK for critical reading of the manuscript. Thanks are expressed to Mrs. WILLIAM L. PETERS for preparation of the illustrations under my supervision, and to Mr. STEVEN L. JENSEN, University of Utah, for the full nymph drawing.

Prosopistoma Latreille, 1833

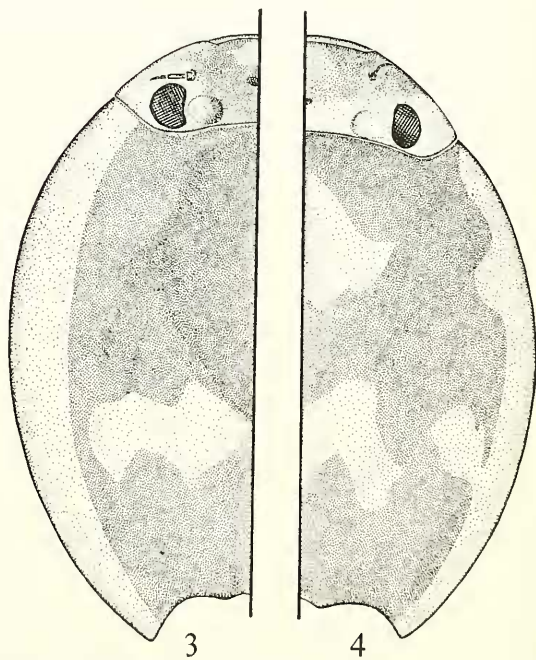
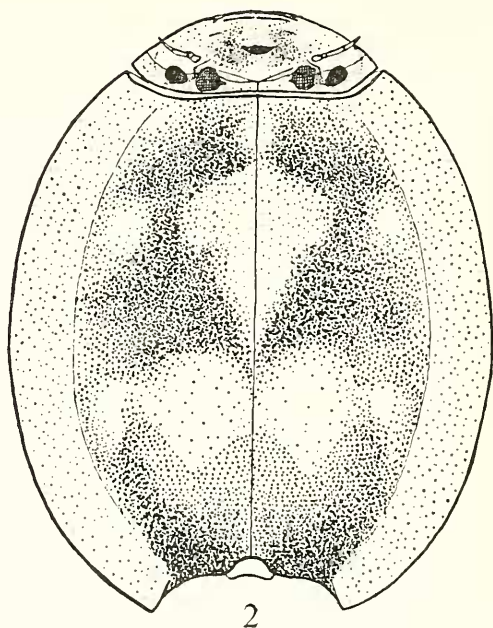
The following key will serve to distinguish the mature nymphs of species of *Prosopistoma* from the Oriental Region.

1. Posterolateral projections on abdominal segments 7—9 broad, truncated (Fig. 9); New Guinea (NE. and NW.), Solomon Islands . . . *P. sedlaceki*
- Posterolateral projections on abdominal segments 7—9 broad, apex pointed (Fig. 8) 2
2. Apex of inner margin of prothoracic tibiae with two apical, long, serrated spines, remainder of margin with minute, unserrated spines (Fig. 33); color pattern of mesonotum as in Fig. 6; Ceylon *P. lieftincki*
- Apex of inner margin of prothoracic tibiae with more than two long, serrated or unserrated spines (Fig. 26—29, 34); color pattern of mesonotum as in Fig. 1—5 3
3. Apex of inner margin of prothoracic tibiae with three to four equal sized spines, apical spine unserrated, remaining spines coarsely serrated (Fig. 28 and 29); six to nine long serrated hairs arising from base of inner mandibular canine (Fig. 18); Mindanao Island, Philippines *P. boreum*
- Apex of inner margin of prothoracic tibiae with more than four equal sized, finely serrated or unserrated spines (Fig. 26—27, 34); three long unserrated hairs arising from base of inner mandibular canine (Fig. 16—17, 21) . . . 4
4. Apex of inner margin of prothoracic tibiae with six finely serrated or unserrated spines (Figs. 27 and 34); color patterns of mesonotum as in Fig. 3 and 5 5
- Apex of inner margin of prothoracic tibiae with eight finely serrated spines (Fig. 26); color pattern of mesonotum as in Figure 2; Java, Sumatra *P. wouterae*
5. Two pairs of lateral indentations in anterior color pattern of mesonotum (Fig. 5); apex of inner margin of prothoracic tibiae with six unserrated spines (Fig. 34); India *P. indicum*
- Color pattern of mesonotum not as above (Fig. 3); apex of inner margin of prothoracic tibiae with six finely serrated spines (Fig. 27); Palawan Island, Philippines *P. palawana*

***Prosopistoma wouterae* Lieftinck**
(Fig. 2, 8, 10, 16, 26)

Prosopistoma wouterae Lieftinck, 1932, Tijdschr. Ent. (Suppl.) 75: 46. — Ulmer, 1940, Arch. Hydrobiol., Suppl. 16: 653. — Lafon, 1952, Bull. Soc. Zool. Fr. 77: 433.

Mature nymph. — General color light brown, darker brown markings on head and mesonotum as in figure 2. Width of head three times length. Antennae five-segmented; segment two $\frac{3}{4}$ length of segments 3—5 (Fig. 10). Outer canine of right mandible with three apical teeth, inner tooth larger, inner margin serrated near apex with three small teeth; inner canine with two apical teeth, inner one larger, outer margin serrated near apex with one small spine, inner margin serrated near apex with two small spines; three long unserrated hairs arising from base of inner canine (Fig. 16). Segment two of maxillary palpi a little longer in length than segment one, segment three a little shorter than $\frac{1}{2}$ length of segment two; three long, unserrated hairs arising from base of apical spines on galealacinia. Segment two of labial palpi $\frac{2}{3}$ length of segment one, segment three $\frac{3}{4}$



Figs. 2—4. Dorsal view of head and mesonotum of mature nymph: 2, *Prosopistoma wonterae* (after Lieftinck, 1932); 3, *P. palawana*; 4, *P. borens* (paratopotype)

length of segment two. Maximum width of mesonotum a little longer than length measured along median suture, shape of mesonotum as in figure 2. Apex of inner margin of prothoracic tibiae with eight equal-sized spines, spines finely serrated as in figure 26. Six abdominal gills; posterolateral projections on abdominal segments 7—9 broad, apex pointed, projections progressively broader apically (Fig. 8). Head and body length 2.8—3.0 mm.

LIEFTINCK (1932) originally described *P. wouterae* from nymphs collected in Western Java. Later ULMER (1940) reported another nymph of this species from Sumatra. LAFON (1952) discussed the distinguishing characteristics of the nymphs.

The above redescription of *P. wouterae* is based on two paratopotypes. Dr. LIEFTINCK (personal communication) informs me that the types of *P. wouterae* are destroyed except for the mesonotum of the holotype and these two paratopotypes which I studied. The mesonotum of the holotype and one undissected paratopotype are now deposited in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden. The dissected paratopotype is now deposited in the collections of Florida A & M University.

The head and mesonotal color patterns are entirely faded on the paratopotypes and both specimens are uniformly light brownish-yellow in color. Fig. 2 illustrating the color pattern of *P. wouterae* is after plate 1, figure 1, of LIEFTINCK (1932) excluding the abdomen and terminal filaments. A new drawing (Fig. 8) is included of the posterolateral spines on abdominal segments 7—9.

Prosopistoma palawana spec. nov.

(Fig. 3, 11, 17, 27)

Mature nymph. — General color light brown, darker brown markings on head and mesonotum as in Figure 3. Width of head a little greater than three times length. Antennae five-segmented; segment two equal to length of segments 3—5 (Fig. 11). Outer canine of right mandible with three apical teeth, inner tooth larger, inner margin serrated near apex with three small teeth; inner canine with two apical teeth, inner one larger, outer margin serrated near apex with two small spines; three long unserrated hairs arising from base of inner canine (Fig. 17). Segment two of maxillary palpi a little longer in length than segment one, segment three a little shorter than $\frac{1}{2}$ length of segment two; three long, unserrated hairs arising from base of apical spines on galea-lacinia. Segment two of labial palpi $\frac{3}{4}$ length of segment one, segment three $\frac{3}{5}$ length of segment two. Maximum width of mesonotum a little longer than length measured along median suture, shape of mesonotum as in figure 3. Apex of inner margin of prothoracic tibiae with six equal-sized spines, spines finely serrated as in figure 27. Six abdominal gills; posterolateral projections on abdominal segments 7—9 broad, apex pointed, projections progressively broader apically. Head and body length 2.5—2.7 mm.

Holotype, ♂ nymph, stream, Bacungan, near Puerto Princesa, Palawan, Philippine Islands, 22-30.III.1947, F. WERNER; paratopotypes, 37 nymphs. Six paratopotypes each deposited in the collections of Florida A & M University, University of Utah, and Bernice P. Bishop Museum. Holotype and remaining paratopotypes deposited in the collections of the Field Museum of Natural History.

Etymology. Palawan, an island of the Philippines.

Nymphs of *P. palawana* can be differentiated from the nymphs of all other species of *Prosopistoma* by the color pattern on the mesonotum (Fig. 3), antennal segment two equal to length of segments 3—5 (Fig. 11), segment two of the labial palpi being $\frac{3}{4}$ length of segment one, and the six equal-sized spines on the tibiae, spines finely serrated as in figure 27. *P. palawana* is most closely related to *P. wouterae* but can be differentiated morphologically by the above characters.

The nymphs of *P. palawana* were collected in a rocky stream near sea level.

Prosopistoma boreus spec. nov.

(Fig. 1, 4, 12, 18, 28—29)

Mature nymph. — General color light brown, darker chestnut brown markings on head and mesonotum as in figures 1 and 4, abdominal terga darker. Width of head a little greater than three times length. Antennae five-segmented; segment two a little less than $\frac{3}{4}$ length of segments 3—5 (Fig. 12). Outer canine of right mandible with three apical teeth, outer one smaller, outer margin serrated near apex, inner margin serrated near apex with three small teeth; inner canine with two apical teeth, inner one larger, inner margin serrated near apical half with five small spines; six to nine long serrated hairs arising from base of inner canine (Fig. 18). Segment two of maxillary palpi $1\frac{1}{2}$ length of segment one, segment three $\frac{1}{4}$ length of segment two; one long, serrated hair arising from base of apical spines on galea-lacinia. Segment two of labial palpi $\frac{3}{4}$ length of segment one, segment three $\frac{1}{2}$ length of segment two. Maximum width of mesonotum a little longer than length measured along median suture, shape of mesonotum as in figures 1 and 4. Apex of inner margin of prothoracic tibiae with three to four equal sized spines, spines coarse serrated as in figures 28—29, and one to two smaller unserrated spines (Fig. 28—29). Six abdominal gills; posterolateral projections on abdominal segments 7—9 broad, apex pointed, projections progressively broader apically. Head and body length 3.8—4.0 mm.

Holotype, ♂ nymph, stream, Burungkot, 1,500 ft., Upi near Cotabato, Mindanao, Philippine Islands, 1-6.I.1947, F. WERNER; paratopotypes, 214 nymphs; paratypes, 28 nymphs, stream, 3,000 ft., E. slope Mt. McKinley, near Davao, Mindanao, Philippine Islands, 24.VIII.1946, F. WERNER. Thirty-five paratopotypes and four paratypes each deposited in the collections of Florida A & M University, University of Utah, and Bernice P. Bishop Museum. Holotype and remaining paratopotypes and paratypes deposited in the collections of the Field Museum of Natural History.

Etymology. — *Boreus*, Gr. meaning north wind.

Nymphs of *P. boreus* can be differentiated from the nymphs of all other species of *Prosopistoma* by six to nine long serrated hairs arising from base of inner mandibular canine (Fig. 18), segment two of the labial palpi being $1\frac{1}{2}$ length of segment one, the three to four equal-sized, coarsely serrated spines on the prothoracic tibiae (Fig. 28—29), and one long, serrated hair arising from base of apical spines on galea-lacinia of maxillae.

The anteromedian macula on the mesonotum of some immature nymphs of the paratopotypes is lighter brown and more distinct. The color markings on the mesonotum of the paratypes are distinct from the holotype and paratopotypes. In the paratypes, the color pattern on the head is less distinct (Fig. 1), the anteromedian macula nearly fuses with the median, transverse light brown band (Fig. 1), and the anterolateral indentations on the anterior color pattern are less distinct (Fig. 1). A full nymph drawing of a paratype was published by EDMUNDS, ALLEN, and PETERS (1963) under the name *P. wouterae*. This illustration of *P. boreus* is included herein as figure 1 with minor corrections of the head and mesonotal color patterns and antennae.

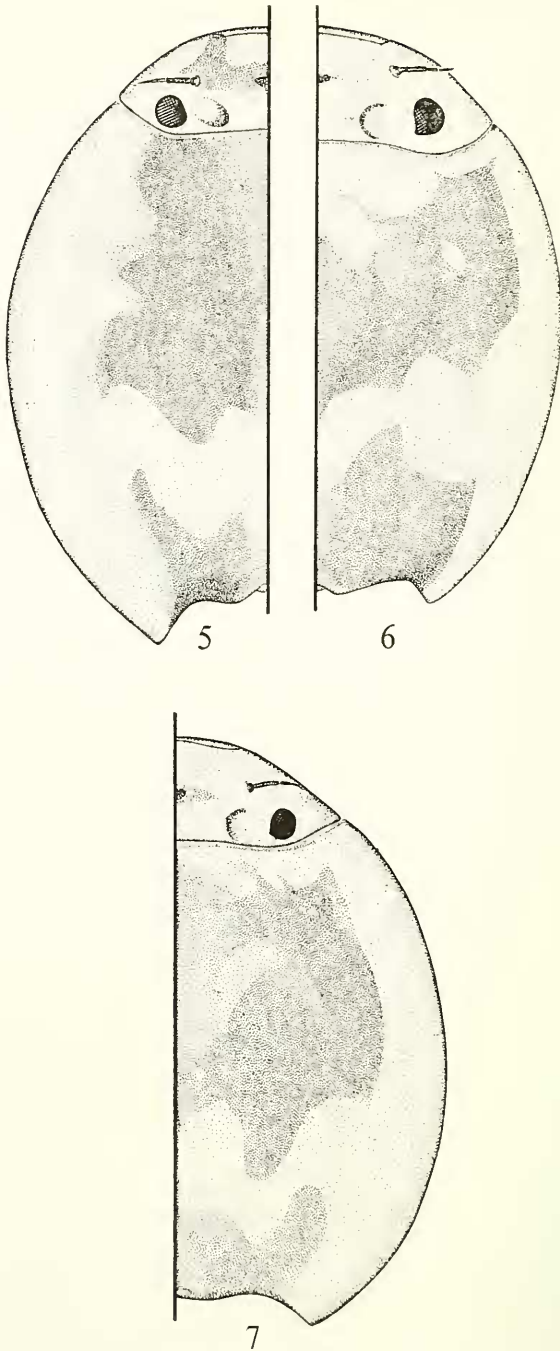
The paratypes are morphologically similar to the holotype and paratopotypes except that six long serrated hairs arise from the base of the inner mandibular canine in the former, while nine long serrated hairs arise in the latter. Also the apex of the inner margin of the prothoracic tibiae in the former has four equal-sized spines and two smaller spines (Fig. 29), but the latter has three equal-sized spines and one smaller spine (Fig. 28). While the two series collected from different localities about 100 miles apart are distinct, judging from total morphological similarity these two series appear to represent the same species. Until reared material is available, I identify the specimens from Mt. McKinley as *P. boreus*.

The paratopotype nymphs of *P. boreus* were collected in a small rocky stream running through forest area. The paratypes were collected in gravel bottom riffles of a small rocky stream.

Prosopistoma sedlaceki spec. nov.

(Fig. 7, 9, 13, 19, 22—25, 30—32)

Mature nymph. — General color light brown, darker chestnut brown markings on head and mesonotum as in figure 7, mesonotum finely pitted, abdominal terga darker. Width of head a little less than three times length. Antennae five-segmented; segment two equals length of segment 3—5 (Fig. 13). Outer canine of right mandible with three apical teeth, outer and middle teeth equal-sized, inner tooth smaller, outer margin serrated near apex with one small tooth, inner margin serrated near apex with five teeth, apical tooth larger; inner canine with two apical teeth, inner tooth larger, outer margin serrated near apex with two large teeth, inner margin serrated near apex with four teeth, teeth progressively larger apically; seven long serrated hairs arising from base of inner canine (Fig. 19). Segment two of maxillary palpi a little longer than $1\frac{1}{2}$ length of segment one, segment three $\frac{1}{5}$ length of segment two; three long, unserrated hairs arising from base of apical spines on galea-lacinia (Fig. 24). Segment two of labial palpi equal in length to segment one, segment three $\frac{1}{3}$ length of segment two (Fig. 25). Maximum width of mesonotum a little longer than length measured along median suture, shape of mesonotum as in figure 7. Apex of inner margin of prothoracic tibiae with two to four equal-sized spines, spines coarsely serrated as in figures 30—32, and sometimes two small unserrated spines (Fig. 30). Six abdominal gills; posterolateral projections on abdominal segments 7—9 broad, truncated, projections progressively broader apically (Fig. 9). Head and body length 3.8—4.2 mm.



Figs. 5—7. Dorsal view of head and mesonotum of mature nymphs: 5, *Prosopistoma indicum*; 6, *P. lieftincki*; 7, *P. sedlaceki*

Holotype, ♂ nymph, Bulolo River, 2950 ft., E. of Wau, New Guinea (NE.), 15-27.X.1964, W. L. & J. G. PETERS; paratopotypes, 4 nymphs; paratypes: 1 nymph, Bulolo River, 2800 ft., 0.8 mi. downstream from junction of Bulolo River and Karinga Creek, NW. of Wau, New Guinea (NE.), 12.X.1964, W. L. & J. G. PETERS; 1 nymph, Lower Mist Camp, 4,600—5,280 ft., S. of Idenburg River, New Guinea (NW.), 31.I.1939, L. J. TOXOPEUS; 1 nymph, brook of Bonegi stream, W. of Honiara, Guadalcanal, Solomon Islands, 29.VII.1962, T. WOLFF. Two paratopotypes deposited in the collections of the University of Utah. Holotype, the remaining paratopotypes, and one paratype deposited in the collections of Florida A & M University. The New Guinea (NW.) and the Solomon Islands paratypes deposited in the collections of the Rijksmuseum van Natuurlijke Historie and Universitetets Zoologiske Museum, Copenhagen, respectively.

Etymology. — The species *P. sedlaceki* is named for Mr. JOSEF SEDLACEK, Resident Director, Bernice P. Bishop Museum Field Station, Wau, Territory of Papua and New Guinea.

Nymphs of *P. sedlaceki* can be differentiated from the nymphs of all other species of *Prosopistoma* by the broad and truncated projections on abdominal segments 7—9 (Fig. 9), the two to four equal-sized, coarsely serrated spines on the prothoracic tibiae (Fig. 30—32), and the seven long serrated hairs arising from base of inner mandibular canine (Fig. 19).

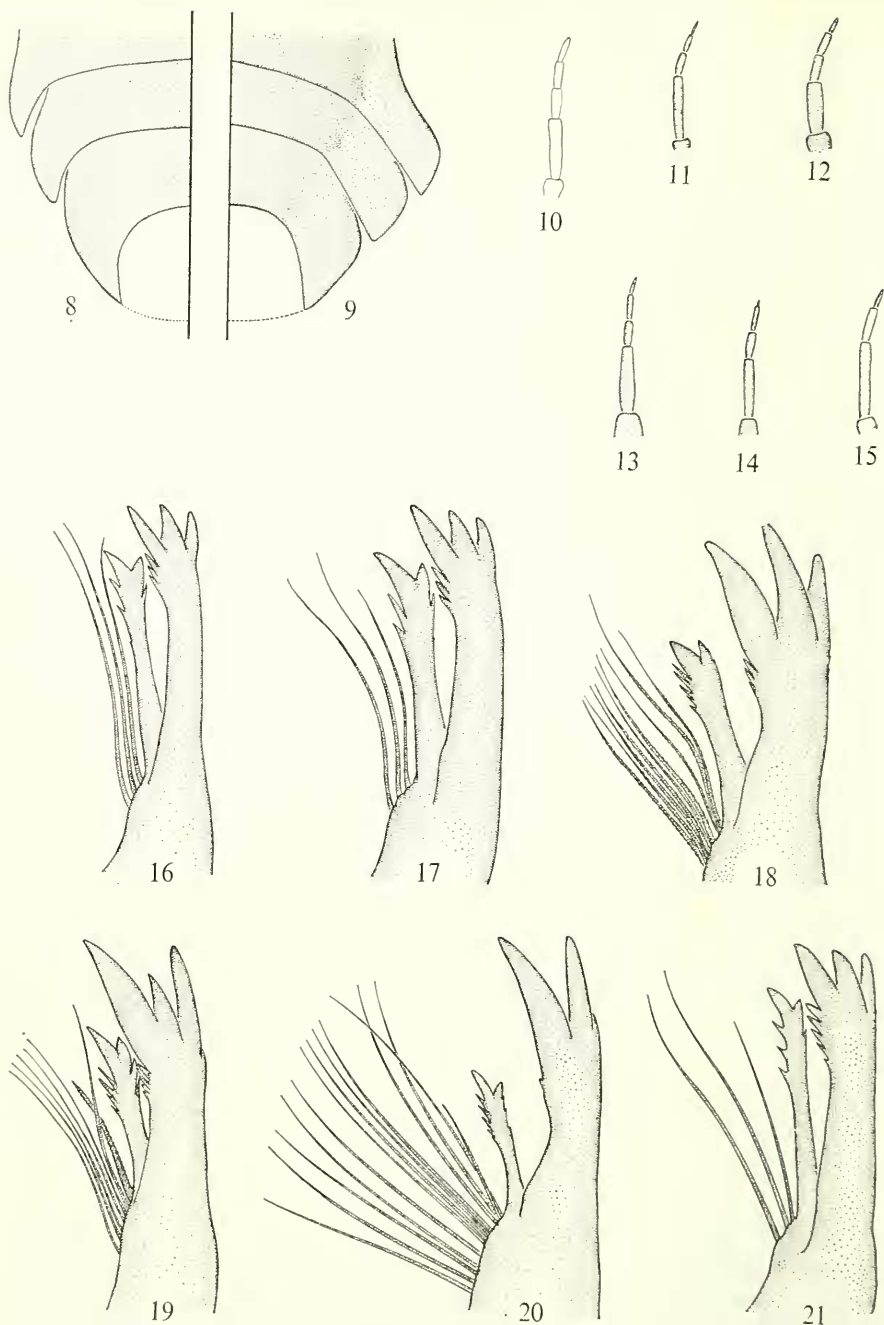
Both the New Guinea (NW.) and Solomon Islands specimens are morphologically similar to the holotype and paratopotypes, except for the number of spines on the prothoracic tibiae (Fig. 30—32). The color pattern on the head, mesonotum, and abdominal terga is faded on the New Guinea (NW.) and Solomon Islands specimens and both specimens are uniformly light brownish-yellow. LIEFTINCK (1956) noted the existence of the New Guinea (NW.) specimen.

Bulolo River is a swift moving river with a maximum depth of three feet. The bottom is composed of small to large rocks. Karinga Creek is used as a drainage system for mining operations at Edie Creek Camp some 17 kilometers southwest of its mouth. At the junction of Karinga Creek and Bulolo River, the water of Bulolo River becomes reddish-brown in color due to suspended rock material. *P. sedlaceki* was collected in the swifter parts of the river at both localities during the dry season. Nymphs were found underneath large rocks.

***Prosopistoma lieftincki* spec. nov.**

(Fig. 6, 14, 20, 33)

Mature nymph. — General color light chestnut brown, darker brown markings on mesonotum as in figure 6, mesonotum finely pitted. Width of head a little less than three times length. Antennae five-segmented; segment two equal in length of segments 3—5 (Fig. 14). Outer canine of right mandible with three teeth, outer tooth subapical, small, remaining teeth apical, inner tooth larger, inner margin near apex with one small spine; inner canine with two apical teeth, inner tooth larger, outer margin near apical half with three small spines, inner margin near apical half with five small spines, spines progressively larger apically; 12—13



Figs. 8—9. Dorsal view of abdominal terga 7—9 of mature nymph: 8, *Prosopistoma wouterae*; 9, *P. sedlaceki*. Figs. 10—15. Antennae of mature nymph: 10, *P. wouterae* (after Lieftinck, 1932); 11, *P. palawanensis*; 12, *P. boreus*; 13, *P. sedlaceki*; 14, *P. lieftincki*; 15, *P. indicum*. Figs. 16—21. Canine area of right mandible of mature nymph: 16, *P. wouterae*; 17, *P. palawana*; 18, *P. boreus* (paratopotype); 19, *P. sedlaceki*; 20, *P. lieftincki*; 21, *P. indicum*.

long unserrated hairs arising from base of inner canine (Fig. 20). Segment two of maxillary palpi two times length of segment one, segment three $\frac{1}{3}$ length of segment two; one long, unserrated hair arising from base of apical spines on galea-lacinia. Segment two of labial palpi a little shorter than length of segment one, segment three $\frac{1}{2}$ length of segment two. Maximum width of mesonotum a little longer than length measured along median suture, shape of mesonotum as in Fig. 6. Apex of inner margin of prothoracic tibiae with two apical, long serrated spines, remainder of margin with minute, unserrated spines (Fig. 33). Six abdominal gills; posterolateral projections on abdominal segments 7—9 broad, apex pointed, projections progressively broader apically. Head and body length 5.0—5.2 mm.

Holotype, ♂ nymph, Rangala, 3,600 ft., 12 mi. ENE. of Kandy, Knuckles Mountains, Central Prov., Ceylon, 11.III.1962 (Swedish Ceylon Exp. 1962: loc. No. 130); paratopotypes, 5 nymphs; paratypes: 3 nymphs, small stream, 5,000 ft., 14 mi. ENE. Kandy, Knuckles Mountains, Central Prov., Ceylon, 11.III.1962, (Swedish Ceylon Exp. 1962: loc. No. 131). All types collected by P. BRINCK, H. ANDERSON, and L. CEDERHOLM. One paratopotype each is deposited in the collections of the University of Utah, Florida A and M University, and Bernice P. Bishop Museum. Holotype and remaining paratopotypes are deposited in the collections of the Zoological Institute, Lund.

Etymology. — The species *P. lieftincki* is named for Dr. M. A. LIEFTINCK, who greatly encouraged this work.

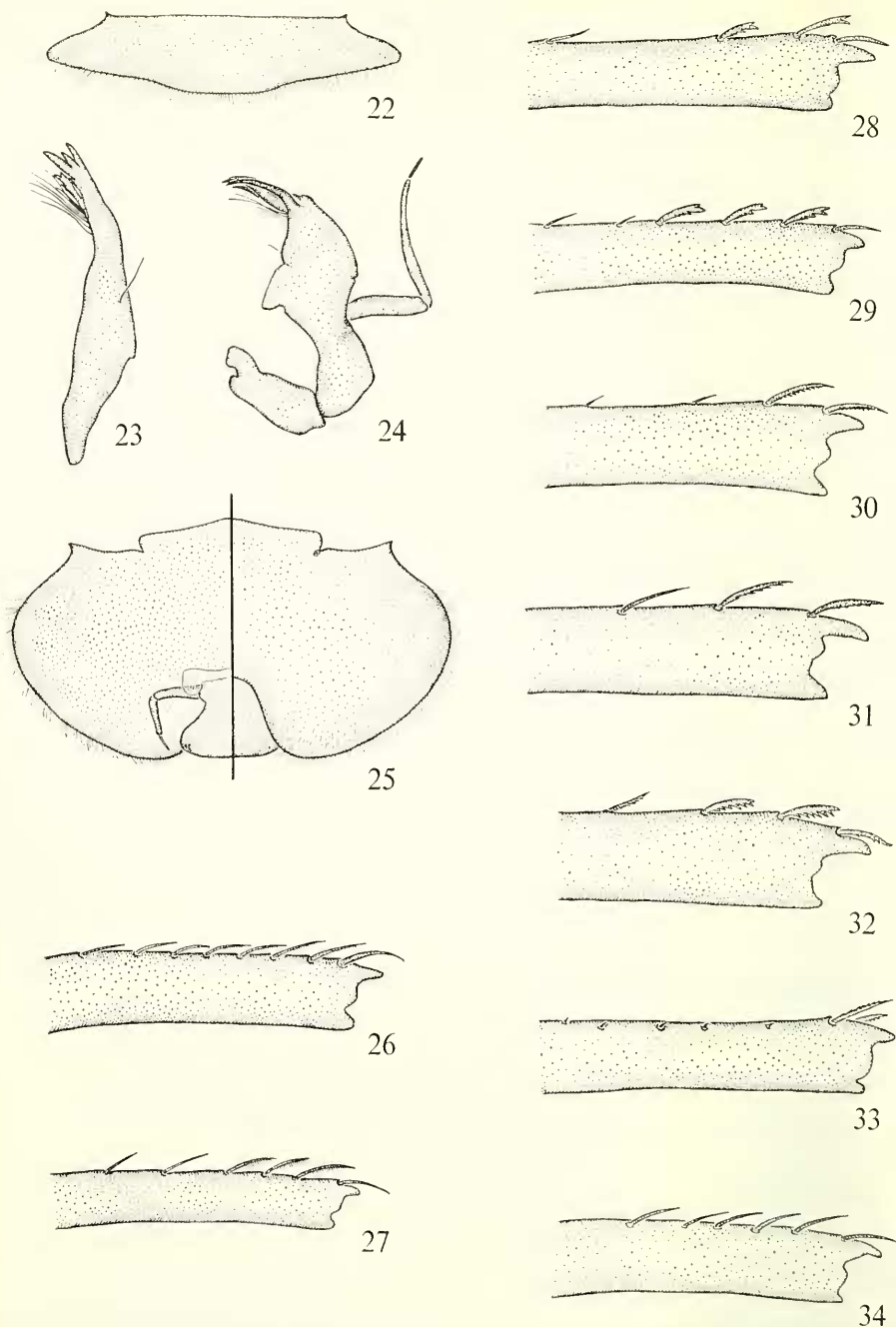
Nymphs of *P. lieftincki* can be differentiated from the nymphs of all other species of *Prosopistoma* by the two long serrated spines and minute unserrated spines on the prothoracic tibiae (Fig. 33), 12—13 long unserrated hairs arising from the base of the inner mandibular canine (Fig. 20), and one long, unserrated hair arising from base of apical spines on the galea-lacinia. The median area of the anterior color pattern on the mesonotum is faded in one mature nymph from each locality. Also in these specimens the small, sublateral, pale maculae are indistinct.

HENRY (1929) reported a single nymph of *Prosopistoma* collected from Ougaldowa estate in Ceylon. This little known record was noted by LIEFTINCK (1956). I have not examined this specimen and do not know if it represents *P. lieftincki*.

Prosopistoma indicum Peters spec. nov.

(Figs. 5, 15, 21, 34)

Mature nymph. — General color light brown, darker chestnut brown markings on head and mesonotum as in figure 5, abdominal terga darker. Width of head a little greater than length. Antennae four-segmented; segment two a little longer than segments three and four (Fig. 15). Outer canine of mandible with three equal-sized apical teeth, inner margin serrated near apex with five small teeth; inner canine with two apical teeth, inner one larger, outer margin serrated near apex with one tooth, inner margin serrated near apical half with three teeth; three long unserrated hair arising from base of inner canine (Fig. 21). Segment two of maxillary palpi $1\frac{1}{2}$ length of segment one, segment three $\frac{1}{2}$



Figs. 22—25. *Prosopistoma sedlaceki*, mature nymph: 22, labrum, dorsal view; 23, right mandible; 24, right maxilla; 25, labium (reduced 0.7 in proportion to remaining mouth-parts), right portion ventral view, left portion dorsal view. Figs. 26—34. Apex of prothoracic tibiae of mature nymph: 26, *P. woulerae*; 27, *P. palawana*; 28, *P. boreus* (paratype); 29, *P. boreus* (paratype); 30, *P. sedlaceki* [New Guinea (NE.)]; 31, *P. sedlaceki* [New Guinea (NW.)]; 32, *P. sedlaceki* (Solomon Islands); 33, *P. lieftincki*; 34, *P. indicum*

length of segment two; two long, unserrated hairs arising from base of apical spines on galea-lacinia. Segment two of labial palpi $\frac{2}{3}$ length of segment one, segment three $\frac{1}{2}$ length of segment two. Maximum width of mesonotum a little longer than length measured along median suture, shape of mesonotum as in figure 5. Apex of inner margin of prothoracic tibiae with six equal-sized, unserrated spines (Fig. 34). Six abdominal gills; posterolateral projections on abdominal segments 7—9 broad, apex pointed, projections progressively broader apically. Head and body length 2.0—2.1 mm.

Holotype, ♂ nymph, Koratty River, Erumeli, 350 ft., 35 mi. E. of Kottayam, Kerala State, India. 5-6.II., W. L. & J. G. PETERS; paratopotype, 1 nymph. Holotype deposited in the collections of Florida A & M University, and paratopotype deposited in the collections of University of Utah.

Etymology. Indicum, L. meaning of India.

Nymphs of *P. indicum* can be differentiated from the nymphs of all other species of *Prosopistoma* by the six equal-sized, unserrated spines on the prothoracic tibiae (Fig. 34), two long unserrated hairs arising from the base of the apical spines on the galea-lacinia of the maxillae, and the two pairs of lateral indentations on the anterior mesonotal color pattern (Fig. 5). The four-segmented antennae of *P. indicum* are not used as a key morphological character for reasons mentioned above.

Koratty River is a large, fast moving river which greatly fluctuates during the seasons. The bottom is composed of small to large rocks all covered with dense algae. *P. indicum* was collected in the swifter parts of the river during the dry season, underneath large rocks.

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